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A DEEP LEARNING MODEL FOR CONTROLLING ANIMAL RELATED CROP DAMAGE

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Abstract: A farmer cannot afford the enormous agricultural revenue losses caused by animal encroachment on his or her property.Despite the fact that agriculture is the largest industry in the recent years, agricultural damage from wild animals has grown to be a significant socioeconomic problem in India. Many animals, including deer, wild pigs, rabbits, moles, elephants, and monkeys, have the potential to seriously harm plants. Animal assaults that result in crop damage are one of the main factors that can lower agricultural production. For picture training of animals and pests, a yolo-based algorithmis used. When animals inflict harm, a machine-based technique detects them and sounds an alarm. The interaction between people and animals has always been contentious since so many Indians are involved in agricultural pursuits that range from small plots to vast tracts of land. Every encounter between a human and an animal in the aforementioned designated regions will be minimised by this effort. A revolutionary deep learning architecture is suggested in this study to both detect the presence of animals and determine what kind of animals they are.

I. INTRODUCTION

Most of the population of India depends accurately or partially on agriculture, which is the foundation of the nation's economy. Where they must feed this enormous population that is growing every year while the size of the arable land is shrinking. It is anticipated that throughout the next five years, the amount of food commodities will increase by about 15-20%. Even though a large portion of the population depends on this industry, they are still unsure whether they want to live in it. After it can be attributed to the variable caused by factors including the environment, seed choice, fertilisation inputs, irrigation, etc..A recent development that contributes to wild animals invasion of the crop yield land. In these region, disputes by the farmers and animals are growing more frequent. There is also in a mountain places and close by a wild and forest places, both of which is serious problems to the farmers great loss. They currently use certain ancient and

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modern techniques to deal with this problem. However they fall short of expectations when it comes to protecting their crops. Computer vision by the AI to that teaches machines environment. Using digital images from cameras and movies, deep learning models, and other methods, machines may identify and classify objects. They can then react to what they observe. There are three phases in the computer vision process:

- Image capture
- Image manipulation
- Image understanding

II. RELATED WORK

The protection of crops of most farmers, residents of communities, and those living in settlements close that forests to bear the heaviest burden of this issues caused significant harm to human communities, man-animal conflict remains the biggest issue in the agricultural industry. A negative effect on the agricultural and living of small marginal farmers. Therefore, it is crucial to scan the farm's perimeter for any activity or unauthorised admissions. Many techniques have been developed by researchers to stop wild animals are steping over the farmland that are growned by the farmers. Farmers or the average person will find it difficult to directly face these creatures or thwart their misadventures, which could be harmful to both the animal and the person. Then function recognises by the sample pictures animal, examines that behaviour, produces a distinctive sound thatfrightens the animal, and sends a message to the relevant person to warn them. An RFID injector may be able to find the animalsby the framing system. It is categorised by the intruding, watch for any wild activity, and then alert sound function then it was proposed by Yadahalli et al. [12].

component of the suggested method is a system board called an Arduino Uno. On the board, there are a number of interfaces for sensors and cameras. The (passive infrared) PIR sensors are capable of detecting motion within a 10-meter range.

It serves as a deterrence to both animals and people. The application of those potential with different values can be used for control the electrical charges. According to the proposed systems instructions, then buzzer is used to alert the farmers when the PIR-based motion sensor has detected the animals. According to the authors, this technique prevents farmers from barricading their crops and remaining in the farm field for a full day.

III. OVERVIEW OF EXISTING ANIMAL INTRUSION ALERT SYSTEM

One of the key components of any research project is the review of the literature. The word "review" refers to the animal incursion alert system and a thorough analysis of IoT-based applications and research methodology. These papers include information regarding surveys and studies about the work completed on the given task. With wired and wireless sensor-based IoT (Internet of Things) applications, numerous methods are utilised to track, monitor, and identify animals in a variety of situations. A dangerous animal early warning system based on IOT was suggested by Sambhaji et al. in 2019[5]. The database of dangerous animals was initially housed in a computer system or cloud that was already connected to the Internet of Things via several sensors. Only when an animal moves in the vicinity of a school is an image acquired using a web camera; the computer system compares the moving image to a database image and

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activates the Ardunio Uno for programming. Then animals is found, it buzzes the alert sound and passed through the messages to mobile phone.

found as an intruder.

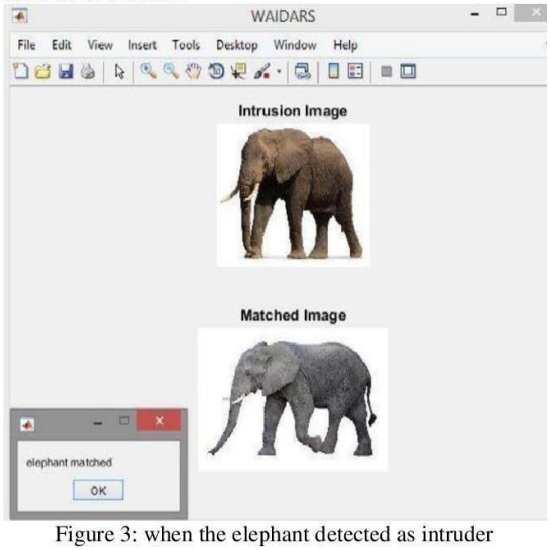

Figure 3: when the elephant detected as intruder

Process

The computer receives the images the camera sends and classifies the animals using them. A database is made and then filled with the collection of sample photographs. The software includes operations like retrieveImage, imageSet, and indexImage. A group of photographs are kept in the ImageSet. Animal classifications require us to submit an pictures by selecting upload, and then the system classifies the image according to the selected class, displaying the animal's information like name in the process. Those query pictures and the database-stored image are the two inputs to the retrieveImage function. The indices for images in the image Index that aesthetically resemble those input pictures are the last import product. Then output for picture IDs lists theindices that are matching from the highest similar to the lowest similar ranked order. The range of values that match is 0 to 1. The collected pictures of the list and stored pictures are similar. After the pictures are falls into the categorise of the stored pictures if these value is discovered to be between 0 and 1, meaning that standard of picture's information are similar to the sample pictures that collected in the dataset. it is leopard. To these pictures is compared with the sample pictures if the score falls between 0.1 and 0.9. The appropriate repellent method is subsequently used when the wild animal has been identified. If an elephant is discovered, a bright light is released. If a leopard is discovered, the obnoxious loud noise is used. As a result, an SMS containing alarm information is issued by the farmland owners and forest officials. No messages is sent if the identified object is not dangerous. False alarms can be avoided in this fashion. Together with the SMS notice,an animal is put off by a repellent system that uses a bright light and an obnoxious loud noise at regular intervals of four seconds. The repellant system operates constantly for increased animal frighteningeffectiveness.

IV. METHODOLOGY

The four steps of the suggested method are Data Collecting, Data Preprocessing, Deep learning approach, and Animal Classification. The subsections that follow go into great detail about these actions.

1. Data Collecting

Photos of animals were gathered from the Animals-10 dataset in the Kaggle repository. Over 28,000 medium-quality images of animals that are more accurate from the following ten categories are included the most of the animals like the elephant and cat.

2. Data Preprocessing

The dataset must be divided into three categories: training, test, and validation. Using Python's split folders function, the

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dataset is divided into training, test, and validation folders in the proportion 5:2:3. Afterwards, ImageDataGenerators are used to create the training, test, and validation sets. Python is employed in this particular model. Jupyter notebook can be used to implement concepts for data cleansing, data visualisation, and machine learning. An input to the algorithm used to recognise animals is given via a surveillance camera that continuously records the field area. The goal of speakers is to generate audio output that is audible at a distance. As a result, the sound that is transmitted from the model to the field area to scare animals away is amplified.

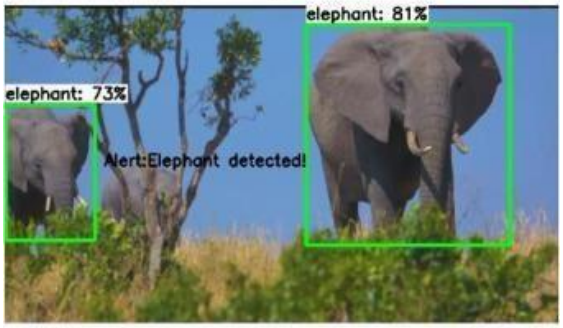
3. Deep Learning Approach

We used deep learning to automatically drive the animals away because the problem mentioned above persisted despite the efforts made to address it. To do the necessary pre-processing procedures and produce an audio file for our project, we used programmes like Keras and Playsound depending on the model's recognised output to provide the appropriate output. Here, the code processes and predicts the frames received from the camera and plays the appropriate repulsive sound to frighten away the detected animal. The input is from the CCTV (Closed Circuit Television).

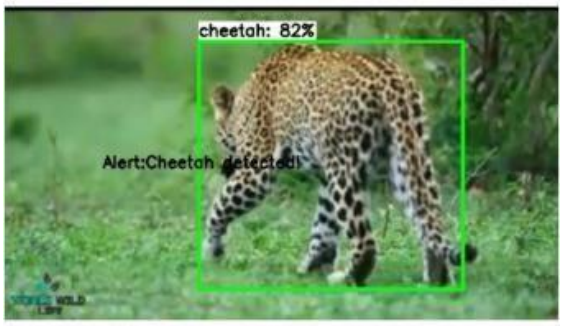
4. Animal Classification

Based on the animals' class probabilities, these layers that are used to exact project for necessary function to categorise these species. As a result, there are ten units in the outputlayer, one for each animal class.. In this effort, a database including 300 datasets of animal photos was developed. For the experiment, 60 photos of each of the five animal classes—horse, zebra, cheetah, elephant, and cow—were gathered. Because the method takes about 40–50 seconds to make a prediction, computation time will be substantially longer. The SSD algorithm uses a backbone model, and its featured network is a pre-trained image categorization network. Those sensors collect information that helps farmers and allow them to monitor farms from anywhere in the world. For the purpose of identifying the objects in this area of the image, 4 4 grids have been employed. In comparison to R- CNN, SSD excels at animal prediction and classification, and computation time is also significantly reduced. For farmers to take the appropriate actions in their farm fields, the Twilio API interface decimates the information.

(a)



(b)



(c)

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V. CONCLUSION

For crops to be successfully grown, crop protection from animal encroachment is essential. Machine learning and the Internetof Things can be used to do this. The effort made to introduce this system for the crop protection from the animals. In India's rural areas, farmers face serious dangers like animal and bird damage. Hence, in order to resolve this problem, we created a system that Animals and birds are startled by sound, causing them to fleeimmediately

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